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**C E R T I F I C A T E**

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Title of the Invention: **BOREHOLE REAMER**

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IPC<sup>7</sup> E21B 7/28**BOREHOLE REAMER**

The present invention relates to drilling technology, particularly to devices for increasing borehole diameter in a prescribed range.

Known in the art is a hole reamer comprising a body with inclined grooves and a piston disposed in the body, spring-loaded through the agency of a rod, legs with journals on which cutters are cantilever fitted [1].

A disadvantage of the known device is that it cannot be reliably centered in a borehole, because its design does not allow locating more than two working members on its body without detriment to the strength of the device. As a consequence, working members experience vibrations and beating in the process of reaming boreholes. The surface of the reamed portion of a borehole proves to be rough, and therefore adequate quality of installing a shut-off device cannot be provided when isolating trouble zones. The rock cutting speed is also low.

Besides, in the known reamer [1] the cutters are cantilever fitted on the legs without fixing the free ends of the journals, this lowering the strength of the working members and leads to their breakage when the mechanical loads are increased.

The prior art most relevant to the present invention in the majority of coincident features is a reamer comprising a body with inclined grooves and a central pass in which a rod is disposed, spring-biased toward a lower end of the body, legs with journals on which cutters are fitted secured in the inclined grooves of the body, and supports in which free ends of the leg journals are secured, the supports interacting with the rod with the aid of pushers [2].

This device suffers from a disadvantage of low efficiency and reliability because of the presence in its design of an annular piston rigidly connected to a rod and of support pushers in the form of a two-link draw bar, which cannot withstand large power loads. Besides, the design of the known reamer does not allow effecting control of bringing its working members into the working position.

It is an object of the invention to enhance the efficiency and reliability of the reamer.

This object is accomplished by that in a borehole reamer comprising a body with inclined grooves and a central pass wherein a rod is disposed, spring-biased toward the

lower end of the body, legs with journals secured in the inclined grooves, on which journals cutters are fitted, and supports in which free ends of the leg journals are disposed, interacting with the rod with the aid of pushers, according to the invention the pushers of the supports are made as cylindrical pistons disposed in inclined bores of the body and sealed with respect to its pass and the environment, one end of each pusher being connected to the support and the other end of each pusher being secured on the rod with the possibility of moving radially relative to the walls thereof, the central pass of the body communicating with the environment via openings which are made in the walls of the body and in the rod and are shut off when the legs with the cutters are advanced into the working position.

On the ends of the body 1 threads are made: thread 24 for connecting to a drilling string 25 (Fig. 2) through an adapter 26 and thread 27 for connecting a drilling bit (not shown), provided with nipples flushing holes.

The borehole reamer operates as follows.

A drilling bit (not shown) is screwed into the thread 27 of the body 1, the adapter 26 is screwed onto the thread 24, the reamer is coupled to the drilling string 25 and lowered into well 28 (Fig. 2).

At a prescribed depth of the well the drilling string 25 is brought in rotation and simultaneously flushing liquid is supplied to the string. The flushing liquid comes into the central pass of the body 1 and further to the flushing openings of the bit, wherein a pressure difference is set up. As the pressure difference above the bit gradually increases, pistons 17 connected to a rod 3 via sliders 20, overcoming the resistance of a spring 4, move supports 16 with cutters 13 and legs 11 secured therein, with the aid of journals 12 along inclined grooves 10 into the working position till they thrust against the end face 29 of the adapter 26. The liquid from space 5 is displaced into annulus 28 of the borehole through openings 6 of the body 1, and openings 7 in the rod 3 are shut off by a thrust bushing 9. A sharp pressure surge occurs in the reamer, and this is a signal that the working members of the reamer have advanced into the working position. Further the borehole expansion in the prescribed range is carried out by driving the tool downward.

On completion of the borehole expansion, injection of liquid into the drilling string 25 is stopped. The spring 4 expands and returns the rod 3 and the pistons 17, supports 16 and legs 11 with the cutters 13 associated therewith into the transportation position.

As the working members are advanced into the working position and returned into the transportation position, the sliders 20 rigidly connected to the pistons 17, travel along

the grooves 22 in the body 1 and move radially in the openings 21 of the rod 3: advance from and retract into said openings.

Such design of the reamer, owing to a more adequate embodiment of the mechanism for advancing the working members into the working position and owing to the provision of control over the advancement of the working members, enhances the efficiency and reliability of the reamer.

#### References cited

1. SU 582373, Cl. E21B 7/28, 1977.
2. RU 2172385, Cl. E21B 7/28, 2001.

### CLAIMS

A borehole reamer comprising a body with inclined grooves and a central pass in which a rod is disposed, spring-biased toward a lower end of the body, legs with journals on which cutters are fitted secured in the inclined grooves of the body, and supports in which free ends of the leg journals are secured, the supports interacting with the rod with the aid of pushers, **characterized** in that the pushers of the supports are made as cylindrical pistons disposed in inclined bores of the body and sealed with respect to its pass and the environment, one end of each pusher being connected to the support and the other end of each pusher being secured on the rod with the possibility of moving radially relative to the walls thereof, the central pass of the body communicating with the environment via openings which are made in the walls of the body and in the rod and are shut off when the legs with the cutters are advanced into the working position.

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BOREHOLE REAMER

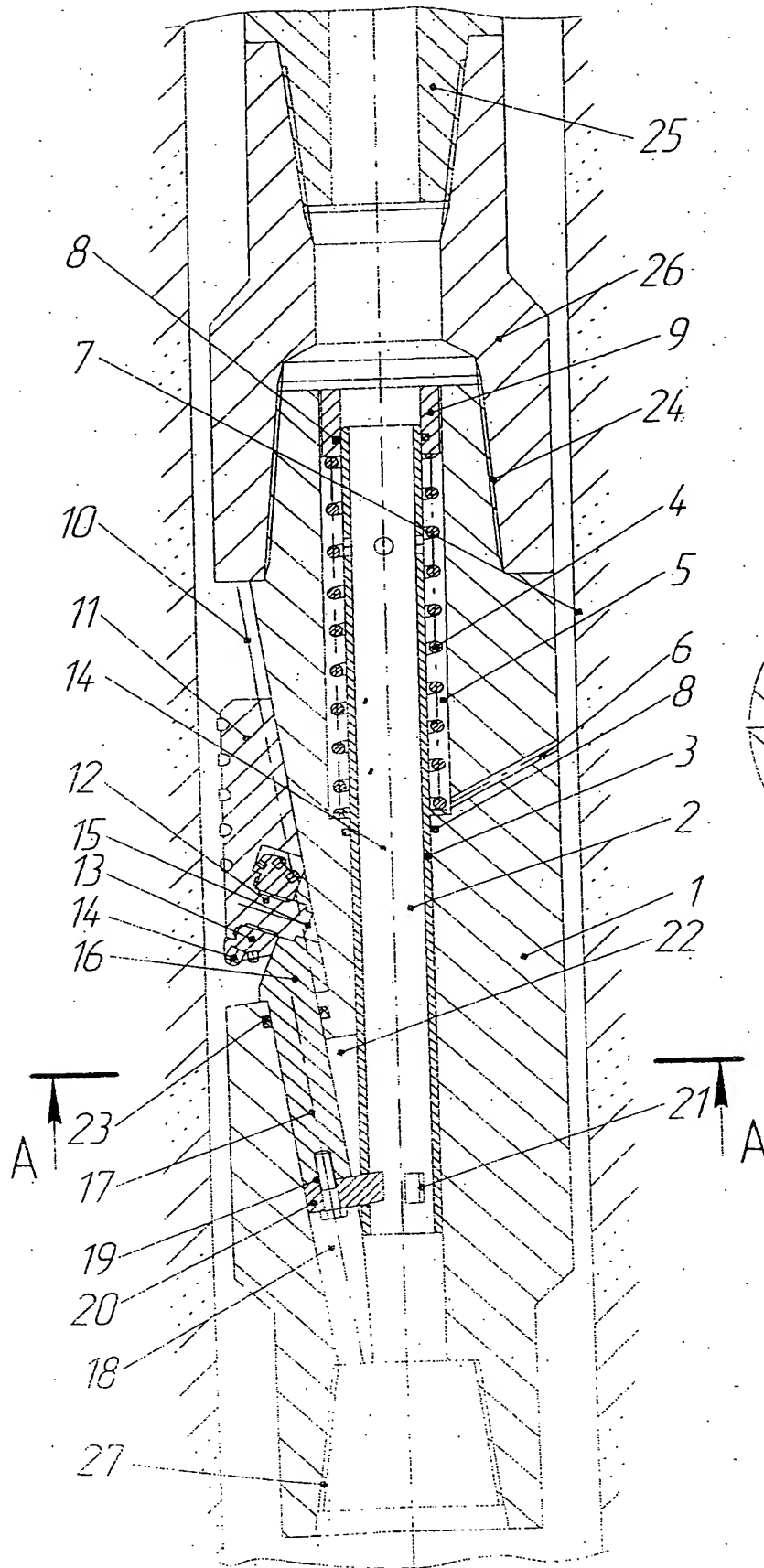


Fig. 1

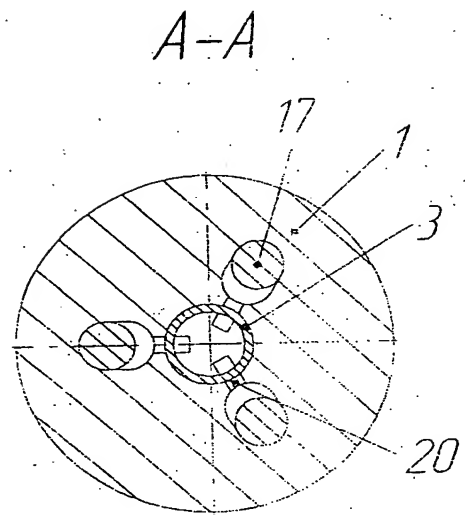


Fig. 3

BOREHOLE REAMER

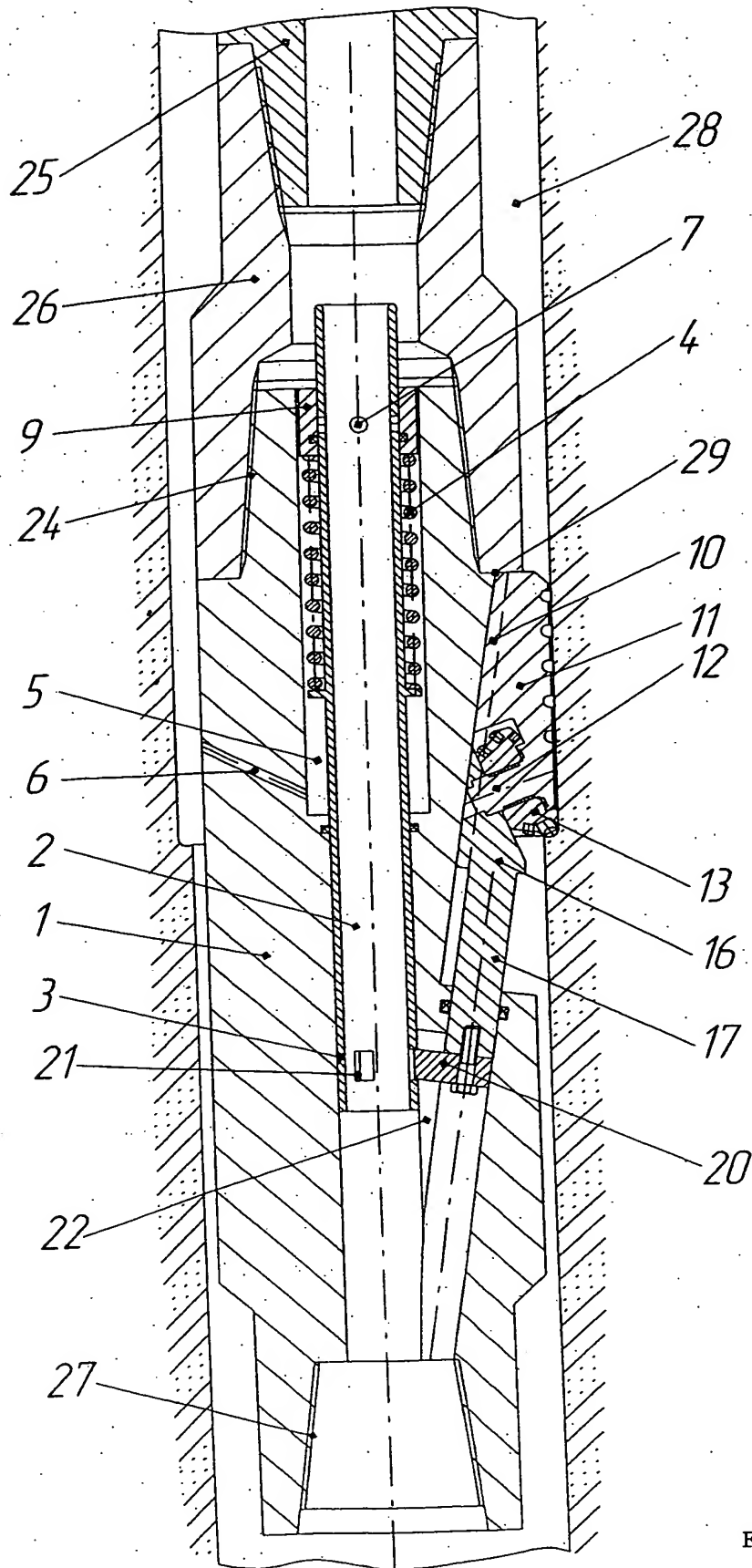


Fig. 2

## **ABSTRACT**

The invention relates to drilling technology, particularly to devices for increasing borehole diameter in a prescribed range.

The body of the reamer has radial openings and a central pass in which a spring-biased rod is disposed with openings in the lower and upper portions thereof, the openings in the upper portion of the rod being shut off when the working members of the reamer are in the working position. On the external surface of the body inclined grooves are made, in which legs with journals installed in supports, on which cutters are secured. The supports are rigidly connected to cylindrical pistons disposed in inclined bores of the body, whose spaces communicate with its central pass and are tightly sealed from the environment. The pistons are connected to the rod with the aid of sliders. The sliders can move radially relative to the rod and vertically in the grooves of the body.

The invention enhances the efficiency and reliability of the reamer.